

From: [ROSETTI, LEANA](#)
To: [Hansen, Kristine S SPK](#)
Subject: [EXTERNAL] FW: Mercury Technical Memo (SE Connector, SPK-2010-01058) (UNCLASSIFIED)
Date: Tuesday, July 15, 2014 2:34:41 PM

Hi Kristine,

Sorry it has taken me so long to give you comments on this Tech Memo regarding mercury methylation. I asked Chris Eckley, our mercury expert, to take a look at it. In the event that they can still be useful to you, here are his comments. It sounds like some of their numbers and extrapolations are not very well founded or clearly described.

How close are you to coming to a decision?

Cheers,

Leana

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-----Original Message-----

From: Eckley, Chris
Sent: Friday, July 11, 2014 12:54 PM
To: ROSETTI, LEANA
Cc: Bain, Andrew W.
Subject: RE: Mercury Technical Memo (SE Connector, SPK-2010-01058) (UNCLASSIFIED)

Hi Leana,

Sorry its taken me so long to respond and read this memo. Just got around to it this morning. Let me know if you have any questions.

--Chris

A few comments.

Regarding: "In addition to elemental mercury present in the soils and sediments, mercury is also present in the water column in the form of Total Suspended Sediments (TSS) and to a far lesser extent as dissolved Methylmercury (MeHg)"

Comment: While it was elemental Hg (ie. Hg₀) that was originally used as part of the mining operations, has data been collected on the Hg in soils and sediment to confirm that it is still in this form? Or are they just assuming that the Hg has stayed in the same form? It may be the case that there is still Hg₀ in the soils/sediments, but it may also be likely that oxidation/volatilization has occurred over the last century resulting in a significant amount of the Hg present as Hg₂₊. In general, elemental and oxidized species of Hg behave quite differently in the environment. Perhaps not particularly important critique in this particular memo, but in general, if they are going to make statements regarding the specific form/speciation of Hg contamination we should make sure they have data to back this up.

If it is the case that most Hg in the water is associated with suspended particles, then the Hg bound to the particles would be an oxidized form (ie. Hg₂₊) and not elemental Hg (Hg₀) which would not bind to suspended sediments.

The sample information they reference from Table 1 doesn't provide any supporting information regarding THg in the water being associated with particulates, so I'm not sure why they included this table.

Regarding: "Using the total Hg and total suspended sediment (TSS) values presented in Table 1,"

Comment: Why was this single grab sample from Oct 2008 chosen for these calculations? Is this the only THg concentration data available? What were the hydrological conditions like when this sample was collected...i.e. baseflow or stormflow conditions. This information is very important since this singular value is being used to calculate an annual deposition. THg concentrations can change by an order of magnitude between baseflow and stormflow conditions, therefore it is critical that more information be provided on the Oct 2008 sample used for annual extrapolation.

Regarding: " This estimate assumes that all (1) suspended sediment contains an average of 0.2 ug/L total mercury"

Comment: The concentration of Hg associated with the suspended sediment would be in ug/mg not ug/L. Or is the assumption being made that 100% of the 0.2 ug/L is bound to particles? The wording here is a bit unclear.

Regarding: " For demonstration purposes we have made this assumption to provide the worst case scenario based on available data."

Comment: They are suggesting that they are being conservative by overestimating the amount of Hg deposited. However, if the 0.2 ug/L value they are using was measured during baseflow conditions and the stormflow concentrations are much higher, then this calculation no longer is a "worst case scenario" but could be an underestimate of deposition. More information on the Oct 2008 sample could help clarify this.

Regarding: " This design reflects a seasonal out-of-bank flow regime that allows for the inundation of the floodplain for several weeks; generally early in the season when temperatures are low, which minimizes the methylation rate as a function of biological metabolism."

Comment: Not clear what season they are referring to. This should be specified. Important to note that methylation in lakes often occurs at ~4 C sediments underlying a hypolimnion. While it is true that higher temperatures can increase MeHg production, the assumption they are making that methylation will be minimal when temperatures are low (they should specify what they mean by low) is not warranted. There are many studies of high MeHg production occurring at a few degrees C. I assume the "low" temperatures being referred to in this memo are quite a bit higher.

Regarding: " Therefore after 100 years it can be assumed that approximately 43 kg of mercury could be deposited on the floodplain."

Comment: Here they're making an estimate over a 100 year time frame based on a concentration from 1 single grab sample. This seems like a huge over extrapolation of an extremely limited measurement.

Regarding: " This is a relatively small risk of future potential sources for methylmercury considering that the proposed project will permanently remove approximately 10,000 kg of Hg from future exposure to the natural and human environment."

Comment: presumably only a very small fraction of the 10,000 kg is currently in a position where it is available for methylation? This is unclear. If the majority of the 10,000 kg is underground, it may have very limited potential to become methylated, whereas the much smaller amount of Hg deposited from the river may have a much higher potential to be methylated. Their bulk comparison of 43 to 10,000 kg seems a bit misleading.

Regarding: " Therefore the best action that can be taken to limit the existing and future methylation potential and associated exposure of the system biota to MeHg is to stabilize the Steamboat Creek system through isolation of the existing Hg as proposed"

Comment: I don't necessarily disagree with this conclusion, I just don't think they have much information to support this conclusion.

Regarding: Later in the same sentence they state " reduce the energy of the system through reconnection of the channel to the floodplain"

Comment: Its unclear how reducing the energy of the system will limit methylation. This should be better explained. In general, I would think that reducing the energy of the water would increase the potential for deposition, development of anoxic conditions, and methylation.